

中国科学院数学与系统科学研究院

量子论与信息论

学术报告

报告题目： Equivalence Checking of Quantum
Circuits by Nonlocality

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摘要： Suppose two quantum circuit chips are located at different places, for which we do not have any prior knowledge, and cannot see the internal structures either. In such a situation, a realistic and fundamental problem is to find out whether they have the same functions or not with certainty. In this paper, we show that this problem can be solved completely from the viewpoint of quantum nonlocality. Specifically, we design an elegant protocol that examines underlying quantum nonlocality, where the strongest nonlocality can be observed if and only if two quantum circuits are equivalent to each other. We show that the protocol also works approximately, where the distance between two quantum circuits can be calculated accurately by observing quantum nonlocality in an analytical manner. Furthermore, it turns out that the computational cost of our protocol is independent of the size of compared quantum circuits. Lastly, we also discuss the possibility to generalize the protocol to multipartite cases, i.e., if we do equivalence checking for multiple quantum circuits, we try to solve the problem in one go.